

by a general description of the structure of fishes and its modifications in the various groups, leading up to a notice of the reproductive phenomena presented by animals of this class, and their growth and variation during development. Other chapters are devoted to the distribution of fishes in time and space, the latter subject treated at very considerable length, and the whole winding up with a notice of those deep-sea fishes our knowledge of which is mainly due to the dredging-operations of the last few years. The remainder of the volume (more than half) is devoted to systematic ichthyology, and gives the characters of the orders and families and of the principal genera, with notes on the more important points in their natural history. The volume is very freely illustrated.

MISCELLANEOUS.

On a new Species of Papilio from South India, with Remarks on the Species allied thereto. By J. WOOD-MASON.

IN December last the Indian Museum received from Mr. F. W. Bourdillon, of Trevandrum, a small collection of diurnal Lepidoptera, amongst which was a much-worn and tattered example of a female insect, evidently closely allied to the North-Indian *P. Castor* and to the Burmese *P. Mahadeva*, with the same sex of the latter of which it turned out on examination to agree in having the discal markings of the hind wing confined to the median region of the organ, where they form a transverse band of lanceolate spots, instead of being diffused over the whole disk and extending into the cell, as in the former.

About a month ago a few species of butterflies were received from Mr. G. H. Kearney, of the Berkodee Coffee-Estate, Koppa Anche, Mysore; and amongst them is a fine specimen of the male, which proves that the species is, as the above-mentioned female specimen had already indicated, more nearly related to *P. Mahadeva* than to *P. Castor*, and enables me to describe it.

*Papilio Dravidarum**, n. sp.

Allied to *P. Castor* and to *P. Mahadeva* †, but more closely so to the latter, with which it agrees in the form of the wings in both sexes.

Sexes alike, having not only the same form of wings, but also the same general type of coloration as the female of the two described species, the male differing from the female only in the darker and richer tints of its upper surface.

♂. Upperside rich fuscous, of a much lighter shade than in

* *Dravide -arum*; from *Dravida*=common name of South-Indian peoples.

† Moore, P. Z. S. 1878, p. 840, pl. li. fig. 1.

P. Castor or even than in *P. Mahadeva*, and more densely powdered with fulvous scales than in either. Anterior wing with the basal area of a richer and darker shade of brown than the rest of the organ; with four distinct longitudinal lines of fulvous scales in the cell, at the extremity of which is a minute but distinct cream-coloured speck; with the outer portion beyond the cell very densely covered with fulvous scales between the veins; with a marginal row of ochraceous white spots placed at the incisures; and with a submarginal series of nine conical or sublanceolate ochraceous ones, each series decreasing at either end and paling towards the costal margin. Posterior wing with the anterior third of its surface devoid of fulvous scales; with the incisures of the outer margin very narrowly edged with ochraceous white; with a submarginal series of seven strongly and angularly-curved lunules or arrow-shaped spots, the four posterior of which are ochraceous white, and the three apical ones cream-coloured; and with a discal band of seven externally-dentate lanceolate cream-coloured spots, all irrorated with fuscous scales except the anterior two; with the cell and the parts of the wing-membrane external and internal to it tolerably thickly sprinkled with fulvous scales. The wing-membrane, being in *both wings* devoid of fulvous scales in the intervals between the submarginal and incisural markings, presents the appearance of having a submarginal row of dark blotches. Underside less richly and deeply coloured, with the markings, especially the spot at the end of the cell, all slightly larger and white, with the exception of the discal series of the hind wing, which are tinged with cream-colour at their inner points; and with the fulvous scales similarly though not quite so thickly distributed over the fore wing, but evenly sprinkled over the whole of the hind wing. Body lighter-coloured than in *P. Castor*, but marked in identically the same manner.

Length of fore wing 2.2 inches, whence $\text{expanse} = 4.5$ inches.

Hab. Koppa Anche, Kadur district, Mysore, South India, at about 2500 feet elevation. Obtained by Mr. G. H. Kearney.

♀. Marked above and below, spot for spot, as in the male, but lighter and less richly coloured, with the spot at the end of cell larger and apparently more distinctly visible on the upperside, and with all the markings (except the submarginal series of the underside of the hind wing, which are white) straw-coloured.

Length of fore wing 2.3 inches, whence $\text{expanse} = 4.7$ inches.

Hab. Trevandrum. Obtained by Mr. F. W. Bourdillon.

In the male of *P. Davidarum* there are visible upon the upper surface of the fore wing a spot at the end of the cell, a submarginal row of conical or sublanceolate spots, and a marginal row of incisural spots; and upon that of the hind wing a discal row of lanceolate spots, a submarginal series of lunules, and incisural spots as in the fore wing.

In the male of the darker-coloured *P. Mahadeva* the incisural spots of the fore wing alone remain; but the hind wing retains its three series of spots, which, however, are all smaller and apparently less clouded with dark scales than in the preceding species.

In the fuscous-black male of *P. Castor* the fore wing may be said to be uniform black, the incisural spots, which alone remain, being so reduced in size as to be barely visible, being, in fact, mere specks confined to the fringe; the hind wing has lost all but the incisural specks (which are similarly confined to the fringe) and the first three or four spots of the discal series, which together form a large and conspicuous cream-coloured blotch divided by the veins. *P. Castor* may, in fact, be described as a rich dead-black insect with a conspicuous cream-coloured blotch near the outer angle of each hind wing.

In *P. Castor*, then, the sexes are, as regards colour and markings, as strongly differentiated from one another as in any species with which I am acquainted; they also differ to some extent in form, the male having the fore wing narrower, with the external margin obviously emarginate, and the hind wing also narrower and produced, with the same margin more deeply incised and lobed than in the female, both pairs of whose wings in form more or less closely* resemble those of both sexes in the other two species.

In *P. Mahadeva* the sexes are also tolerably well, though not so conspicuously, differentiated in point of colour and markings as in *P. Castor*, but not at all in form, the wings being of the same shape in both sexes.

In *P. Dravidarum* the sexes agree perfectly both in form of wings and markings, differing very slightly in colour only; so that but little sexual differentiation has here taken place.

The female of *P. Dravidarum* is scarcely distinguishable, as far as one can tell from a description alone, from that of *P. Mahadeva*, the only differences that I can make out being that in the latter "the fore wings have very small and less distinct submarginal white spots, and no spot at the end of the cell." From that of *P. Castor*, however, it is readily distinguished by having, as I have already pointed out, the discal markings of the hind wing in the form of a transverse band of short lanceolate spots.

At the meeting of the Linnean Society of London held on the 18th March last, a paper by Prof. Westwood on a supposed polymorphic butterfly from India was read. In this memoir the following conclusions are said (*vide* abstract in 'Nature,' vol. xxi. p. 531, April 1st, 1880) to have been arrived at by the author:—" (1) That *Papilio Castor* is the male of a species whose females have not yet been discovered; (2) that the typical *P. Pollux* are females, of which the males (with rounded hind wings having a diffused row of markings) have yet to be discovered; and (3) that the coloured figures given by the author represent the two sexes of a dimorphic form of the species."

With regard to the last of these conclusions I cannot speak, because neither the paintings nor the specimens in question are acces-

* The females present an inconspicuous dimorphism, some having retained the primordial form of hind wing, while others have the outer margin of this wing toothed as in the male (*vide infra*).

sible to me ; but, having spoken above as if the opposite sex of *P. Castor* were perfectly well known to naturalists, while, according to Prof. Westwood, it is still undiscovered, I ought perhaps to say a few words about the material on which my remarks are based.

Papilio Castor is restricted in its distribution to the slopes and valleys of the hill-ranges of North-Eastern India and to the parts of the plains in immediate contiguity to them, its place being taken elsewhere, as in Southern India, by the new species described in the preceding pages, and in Burmah by *P. Mahadeva*. The Indian Museum possesses specimens from the southern slopes of the Khasi hills (Silhet), from the Sikkim hills (Darjiling), Cherra Punji in the Khasi hills, and the Naga hills ; and three males were taken by Lieut.-Colonel Godwin-Austen during the Daffa expedition ; in these last, in a large male from Cherra Punji, and in two specimens of the same sex from the Naga hills, the upper surface is dark brown, of a much lighter tint than in nine males recently received from Sikkim (two) and Silhet (seven), which are all brown-black of so dark a shade as to appear quite black except when a strong light falls upon them, when their colour appears brownish ; in fact the brown of the former is to that of the latter series of specimens what dark green is to the colour known as "invisible green." In the large Cherra-Punji specimen the short tooth, or rudimentary tail, into which the third branch of the median vein of the hind wing is usually produced, does not extend beyond the line of the other lobes of the outer margin ; and one of the three dwarfed winter specimens* captured by Colonel Austen approaches it in this respect ; moreover one of the Silhet specimens has this tooth smaller in one wing than in the other ; so that this, like secondary sexual characters in general, is subject to variation. It is possibly to difference of station, but probably to long exposure to the vicissitudes of the Calcutta climate, and to the application of benzine and other noxious substances to which they were subjected before I took over the charge of the collection of Lepidoptera, that these brown specimens owe their lighter coloration. However this may be, it may confidently be asserted that it would be impossible for the most inveterate species-maker to discover any character by which to separate them as a distinct species or race from the fresh and consequently dark Sikkim and Silhet specimens. So much for the males.

Of the nine females in the collection referred by me to *P. Castor*, seven, being perfect, can readily be divided into two sets, according to the form of the outer margin of the hind wing :—three (one from Assam, one from Cherra Punji †, and a large one from Silhet)

* The insect figured by Westwood (Arcana Entom. vol. ii. pl. 80. fig. 2) seems to have been a similarly dwarfed and faded individual.

† There is another specimen from Cherra Punji (the largest of all in the collection), with the outer margins of its hind wings so ragged that it is impossible to be quite sure to which form it belongs, though, from its close agreement in other respects with Westwood's figure in the 'Arcana,' as well as with the other insect from the same locality, I should say it is a typical *P. Pollux*.

having the third branch of the median vein not produced, and the outer margin of the wing consequently "rounder," being in fact typical *P. Pollux*; and four (two from Silhet* and two from Sikkim †) having that veinlet produced into a small tooth, as in the male. I consider that these two different forms are both females of *P. Castor*, and that the slight differences they present are explained on the supposition, warranted by numerous analogous facts in nature, that the secondary sexual characters acquired by the male have been partially transmitted to some females, but not to others (*P. Pollux*), which have retained the primordial rounded form of wing.

The fact that the discoidal markings of the hind wing in the two Silhet females with toothed wings are lighter and more distinctly cream-coloured than in any of the females with rounded wings, that the malformed specimen from the same locality (which certainly belongs to the form with toothed hind wings) has these markings in the fourth, fifth, and sixth interspaces (those, that is to say, corresponding to the ones forming the principal part of the blotch in the male) of almost as rich and pure a colour as in that sex, and that one of the two former has the spot at the end of the cell and the submarginal markings of both fore wings obsolete and is thus still further approximated to the male, do certainly seem to me to tell rather for than against the above supposition.

The *Helenus* group of *Papilios*, to which *Papilio Castor* and its allies unquestionably belong, taken as a whole, presents us with a remarkable series of gradations in the amount of difference between the sexes, comprising, as it does:—one species (*P. Dravidarum*) in which the sexes closely resemble one another in the form of the wings and in colour and markings, and there is only an incipient

* There is a third specimen from Silhet in the collection, taken at the same time and place as the other two; but it unfortunately has the hind wings symmetrically malformed at their outer margins, the third lobule on each side being short and angulated, and the fourth being somewhat longer than usual and also angulated. This malformation is interesting as showing in the same specimen the instability of this character, the strong tendency to the assumption of the male form of wing exhibited in the lengthening of the lobule next in order, and the unmistakable "reversion" to the rounded form of wing in the suppression of the rudimentary tail.

It should be mentioned that a gynandromorphous example of the form of female described by Prof. Westwood as *P. Pollux* has been figured and described as *P. Castor* by G. Semper in Wien. entom. Monatschr. 1863. Band vii. p. 281, Taf. 19. In this specimen both the wings of the left side are truly female; but on the opposite side the posterior portion of the fore wing from the first discoidal veinlet to the inner margin on the upperside only, and the anterior portion of the hind wing from the costal margin to the second branch of the subcostal on both sides, exhibit the masculine livery, not unmingled with female characters (*conf.* Westwood in Thes. Ent. Oxon. p. 187).

† The two Sikkim specimens have the tooth less developed and the discal markings of the hind wings exactly like those of the other form (*P. Pollux*).

sexual differentiation; another (*P. Mahadeva*) in which, while agreeing in structure, they differ to a considerable extent in markings and colour, and the secondary sexual characters of the male are much more pronounced; another (*P. Castor*) in which they differ from one another to such a remarkable extent, that no less an authority than Prof. Westwood originally described them under different names, and still maintains their distinctness, and Mr. Wallace* placed them in different groups of the genus—the male having acquired the most pronounced secondary sexual characters (including rudimentary tails), which have been partially transmitted to some females but not to others, and the two forms of female having retained, one of them the form of wings, and both the general style of colouring, characteristic of both sexes in the first-named species; and, finally, others (*P. Helenus*, *P. Chaon*, &c.) in which the male has perfectly transmitted to the opposite sex all the secondary sexual characters (including the long tails) that he had acquired, the female only differing from him in such trifling points as the lighter coloration of the outer half of both wings and the dingier shade of the upper surface generally.

From these and other facts, we are, I think, entitled to infer the probable descent of all the members of this group from an ancestor with tailless, rounded wings in both sexes, closely resembling *P. Dravidarum*, but with diffused discal markings in the hind wings, and probably also in the fore wings—the conspicuous wing-blotches of *P. Helenus*, *P. Castor*, &c. having apparently resulted from the concentration, so to speak, of such diffused colouring in the direction of the breadth of the wing, just as have the discal bands of short spots in *P. Dravidarum* and *P. Mahadeva* from a similar process of modification in the opposite direction.

If his conclusions are correctly reported, Prof. Westwood's drawings must represent a species different from either of those alluded to herein; and I look forward with much interest to the appearance of his paper.—*Proc. As. Soc. Beng.* 1880, No. 3.

On a highly organized Reptile from the Permian Formation.

By M. A. GAUDRY.

M. Roche, director of the Ironworks of Igornay, to whom we are already indebted for several discoveries of curious fossils, has just found, in the Permian, a new genus of reptile, which he has presented to the Museum of Paris. The Igornay animal is the most perfect of those which have hitherto been met with in the Primary formations of France. I propose to name it *Stereorachis dominans*.

In *Stereorachis* the vertebræ present a striking contrast to those of the reptiles of the same deposits. While in *Actinodon* and

* In his well-known memoir "On the Phenomena of Variation and Geographical Distribution as illustrated by the Papilionidæ of the Malayan Region," in *Trans. Linn. Soc. Lond.* vol. xxv. pp. 33, 34.